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SCOTT
SCOTT WORLDWIDE

April 2, 1990

Mr. Richard Breitenstein
Bureau of Water Quality
Pennsylvania Dept. of Environmental Resources
1875 New Hope Street
Norristown, PA 19401

RECEIVED
90 APR -5 PM 2:06
DER-ENV. PROTECTION
NORRISTOWN

RE: Soil Remediation Work Plan

RKB

Dear Mr. Breitenstein:

As per our recent phone conversation concerning Scott Paper Company's desire to remediate on-site contaminated soil excavated during the recent removal of underground storage tanks from the site, please find enclosed two copies of a preliminary work plan for soil pile remediation developed for Scott Paper Company by Groundwater Technology, Inc. of Chadds Ford, PA.

The work plan specifies that the soils will be treated on-site using air-driven bioremediation. Compared to other treatment alternatives, such as landfilling or incineration, we feel that bioremediation would be a more efficient use of available resources. As we discussed in our recent phone conversation, a general agreement in writing with the treatment approach and work plan scope would allow us to proceed with the detailed engineering and site preparation required by the project.

If you have any questions or comments concerning the enclosed work plan, please contact me at (215) 499-6104.

Sincerely,

David R. Haldeman

David R. Haldeman
ENVIRONMENTAL SPECIALIST

Enclosure

cc: Mr. R. K. Anderson
Mr. M. M. Caron - Staff
Ms. A. E. Perry - Groundwater Technology

DER RECEIVED
NORRISTOWN
APR 05 1990

GROUNDWATER TECHNOLOGY, INC.

Rt. 1 Chadds Ford West, Chadds Ford, PA 19317
(215) 388-1466 FAX (215) 388-6298

PRELIMINARY WORK PLAN
SOIL PILE REMEDIATION

Scott Paper Company
Front and Avenue of the States
Chester, Pennsylvania

Submitted to:

Scott Paper Company
Front and Avenue of the States
Chester, Pennsylvania

Submitted by:

Groundwater Technology, Inc.
Chadds Ford West, Route 1
Chadds Ford, PA 19317
(215)388-1466

March, 1990

Prepared by:

A. Elizabeth Perry
Hydrogeologist

Robert A. Norris, PhD
Senior Microbiologist

Reviewed by:

Mark J. Wrigley, P.G.
Territory Manager

TABLE OF CONTENTS

APPENDICES

PRELIMINARY WORK PLAN
SOIL PILE REMEDIATION

Scott Paper Company
Front and Avenue of the States
Chester, Pennsylvania

1. Introduction

Scott Paper Company (Scott) has contracted Groundwater Technology, Inc. to prepare a conceptual work plan for remediation of approximately 1300 cubic yards of contaminated soils. The work plan will be submitted by Scott Paper to the Pennsylvania Department of Environmental Resources (PADER) for review.

Between August and October, 1989, the Scott Paper Company removed seven underground storage tanks from their Chester Operations facility. The tanks were used to store the following products:

- No. 2 fuel oil,
- gasoline,
- kerosene,
- waste oil,
- mineral oil, and
- virgin xylene solvent.

The tank removal activities have been presented in a report submitted to the PADER entitled "Underground Tank Removal Report for Scott Paper Company, Chester Operations, Chester, PA, November 6, 1989, prepared by Buckhart-Horn, Inc., of York PA." The summary presented below is based on information from the Buckhart-Horn report. During the tank removals, contaminated soils were observed in the vicinity of each tank. These soils were excavated and stored in containers or stockpiled at three locations on the Scott property. These locations are summarized below and shown on the facility map in Figure 1, Appendix A.

- Approximately 50 cubic yards of sand from inside one of the xylene tanks are stored in three roll-off containers;
- Approximately 840 cubic yards of soil formerly surrounding the waste oil, fuel oil, mineral oil, and xylene tanks are stockpiled at the coal yard; and,
- Approximately 410 cubic yards of soil and sand from the gasoline and kerosene tanks are stockpiled on the northern portion of the Scott property.

There are several options for handling this soil. These include landfilling, incineration, or on-site treatment. Because the soils associated with the xylene tanks are considered a listed hazardous waste under 40 CFR 261 of RCRA, both landfilling and incineration would be very costly. As an alternative, on-site treatment of the soils by air-driven bioremediation would be a significantly more efficient use of resources. In addition, bioremediation results in the actual destruction rather than transfer of the contaminants and so substantially reduces the potential liabilities associated with landfilling.

Based on these considerations, Scott has requested that Groundwater Technology investigate the feasibility and permitting requirements for biotreating the soils on-site. This report presents a preliminary work plan to be presented to the PADER for review.

2. Theory of Biotreatment of Contaminated Soils

Naturally occurring aerobic bacteria can effectively utilize a wide range of organic chemicals, converting them to innocuous products. The applicability of biodegradation for treating petroleum hydrocarbon contamination (e.g., gasoline, diesel, fuel oil and crude oil) has been adequately demonstrated by numerous successful soil treatment systems and has been documented by Groundwater Technology and others, including the EPA in their recent workshop for EPA case managers.

During biodegradation, the naturally occurring bacteria utilize petroleum hydrocarbons as a food source. Hydrocarbon molecules are either converted to new cell material, or carbon dioxide and water. The bacteria eventually die and are converted by other bacteria to new cells, or carbon dioxide and water. The cell material consists not only of carbon and hydrogen, but also of many other elements, particularly nitrogen, phosphorus, and oxygen.

Efficient biodegradation of petroleum hydrocarbon compounds requires an adequate supply of nitrogen, phosphorous, oxygen, and moisture relative to the available carbon food source. In general, carbon does not accumulate in the subsurface environment because sufficient oxygen and nutrients are present for complete degradation to balance the load. However, if any of these factors become limited, biodegradation becomes an inefficient process.

When soil contamination occurs from spills or leaks of petroleum hydrocarbons, the carbon load on the environment drastically exceeds the natural availability of oxygen, nitrogen, and phosphorous. Because of the abundance of hydrocarbons, the rate of biodegradation of these materials is slow, resulting in their persistence in the environment. If, however, the balance between the carbon load and the nutrient/oxygen requirements can be reestablished, biodegradation can be an efficient process.

The key, therefore, to the effective bioremediation of soils is to provide the essential nutrients in the correct proportions and thus drive the system to rapidly degrade the hydrocarbons.

Nitrogen and phosphorus are provided to the system by the addition of a nutrient blend in the form of food-grade ammonium and phosphate salts. Oxygen can be supplied as either air or oxygen. Air supplied through positive or negative pressure soil venting techniques is an efficient source of oxygen.

Above ground soil piles represent a particularly efficient method of biodegrading organic contaminants found in soils. The soil cells are constructed by placing an impervious material such as a polyethylene or other compatible liner over the treatment area, placing nutrient amended soils on the liner in shallow lifts, laying slotted PVC piping between lifts, covering the pile with a second liner, and connecting the PVC piping to the suction side of an air blower. Air is pulled into the pile through the PVC piping to provide oxygen. Depending on the specific contaminants, cell location, and state regulations, the discharge from the blower may have to be treated with activated carbon or a catalytic scavenger.

Soil cells are efficient because nutrients are mixed with the soils during construction so that only oxygen must be supplied during operation. A 100-CFM air pump can supply 2300 pounds of oxygen per day; enough oxygen to degrade 800 pounds of hydrocarbons if fully utilized. Actual degradation rates, while substantial, would be significantly less.

3. Bioremediation at Scott Paper Facility

The specific compounds found in the soils at the Scott Paper facility (kerosene, waste oil, fuel oil, mineral oil, gasoline, xylenes and ethylbenzene) are readily biodegradable. The levels of these components in the soils at Scott, while requiring treatment, are relatively low with respect to many soils previously treated by Groundwater Technology in above ground soil cells. Further, the composition and consistency of the soils, especially the sands, are compatible with this technology.

3.1 Preliminary Design of System

This conceptual work plan presents a preliminary design for bioremediation of the soils at Scott, and is based on the data presented by Buckhart-Horn, a site visit and inspection by

Groundwater Technology personnel, logistical considerations presented by Scott Paper, and some additional laboratory analyses performed by Groundwater Technology, Inc. The purpose of this preliminary work plan is to receive a preliminary approval from the necessary regulatory agencies. Preliminary agency approval will be obtained before proceeding with the more costly design process.

Groundwater Technology, Inc. collected composite soil samples from the stockpiles on February 8, 1990. The samples were submitted for laboratory analyses to determine whether any conditions are present that would inhibit biological treatment. For example, an extremely low or high pH would create an unsuitable environment for bacterial growth. In addition, the soils were tested for the presence of heavy metals which are untreatable by biodegration.

The results of the laboratory tests are presented in Appendix B. The results do not indicate any adverse conditions for bioremediation. The only metal present, mercury, was detected below the level at which the soils would be considered toxic under 40 CFR 261 (RCRA).

As part of the final design process, subsequent testing may be required to establish design criteria, such as nutrient blend required for efficient degradation. These tests will be conducted by amending soil samples with nutrients and determining the rate and extent of degradation as compared to control samples.

When the PADER approves the preliminary design, a final design will be completed. The final design may be a modification of the design presented here based on feedback from the state and any additional information received. A process and instrumentation diagram will be provided with the final design to facilitate the operation and maintenance of the system.

3.2 Construction of Treatment Cell

Scott Paper has selected a portion of the Coal Yard as a convenient location for the treatment area. Because the Chester Creek bisects Scott's property between the Coal Yard and the North Pile, the soils stockpiled at the north end of the facility will require transportation across a bridge outside of Scott property to reach the Coal Yard. The soils in the north pile were excavated from around the kerosene and gasoline tanks and are therefore non-hazardous. Consequently, the soils can be loaded into a standard dump truck for transport to the coal yard without manifesting.

The treatment site will be cleaned of debris and graded to allow for placement of the treatment cell. The surface soils in this area will be sampled and analyzed by EPA Methods 8015 and 8020 to establish background levels prior to cell construction. The pile area will be leveled and an impermeable plastic liner will be placed over the area of construction. A berm consisting of landscape ties will be constructed along the outer edges of the treatment area to control runoff. The liner will cover this berm. A three- to six-inch layer of gravel containing two-inch slotted PVC pipes will be placed over the liner to facilitate and control drainage.

Groundwater Technology has designed the soil cell to consist of two piles with dimensions approximately 90 feet by 40 feet and a height of six feet. The proposed location of the soil cell is shown on Figure 2, Appendix A. A work area surrounding the piles as shown is needed to facilitate loading and construction. The soils will be transferred from the current stockpile locations to a paved transfer point within the work area and will be placed on the cell with a front-end loader in two-foot lifts. The soils will be sprayed with END^{tm}-122 nutrient solution during loading. The END^{tm}-122 nutrient solution is a phosphorus and nitrogen source mixed to a standard concentration.

During construction, the xylene contaminated soils will be kept separate from the other soils. Because these soils are regulated under RCRA, their final disposition is likely to be different than that of the other soils. In addition, laboratory testing may indicate that the waste oil contaminated soil stockpile should also be kept apart due to the possible presence of additional compounds.

Lengths of two-inch diameter, 20-slot, schedule 40 PVC pipe will be installed on top of the initial 24 inches of contaminated soil. The second soil lift will then be placed over the piping and also sprayed with the END^{tm}-122 nutrient solution during loading. A second row of pipes will be added and a final two feet of soil added. The slopes of the soil pile will not exceed 45 degrees. Probes to monitor moisture and to obtain air samples from within the pile during operation will also be installed at appropriate locations during construction. Four-inch diameter slotted PVC pipe will be placed along the top of the soil to facilitate air flow into the soil. A schematic and a cross-sectional view of the conceptual design for the soil pile are shown in Figures 3 and 4, Appendix A.

During construction of the soil piles, soil samples will be collected and submitted for laboratory analysis. Composite soil samples will be collected from the two-foot and four-foot horizons and analyzed by EPA Methods 8020 and 8015. The analyses will be used to document baseline levels of hydrocarbons in the soils.

The finished treatment cell will be covered with a reinforced polyethylene cover. The polyethylene cover will be secured to the landscape ties around the perimeter of the pile to help direct rainwater off the soil pile. The ends of the four-inch PVC piping will extend through the cover to serve as a fresh air intake system during operation of the ventilation system. This piping can also be used to introduce additional nutrients and moisture into the soil, if necessary.

3.3 Air Flow System

In order to adequately oxygenate the entire pile, a single one- to two-horsepower blower will be connected to the PVC piping within the pile. The slotted PVC pipes extending out from the pile will be manifolded and connected to this air pump using two-inch diameter schedule 40 solid PVC pipe. The vacuum system, which will be housed in a weatherproof enclosure, will be equipped with a moisture trap to prevent moisture present in the air stream from entering effluent vapor control units.

3.4 System Operation and Maintenance

The treatment process requires minimal maintenance and is suitable for operating unattended for long periods of time. However, the air flow rate will be adjusted periodically to maximize the degradation process relative to soil venting, and to keep the air flow proportional to contamination levels in various portions of the pile. That is, higher oxygen levels are introduced into the more highly contaminated portions of the cell.

As part of the maintenance program, the general condition of the site will be inspected periodically. The polyethylene tarp will be inspected for wind damage and tears. The stockpile will be inspected for signs of erosion. The blower will be operated continuously to provide a constant supply of fresh air through the pile. Nutrients will be batched and added periodically, if necessary.

3.5 Monitoring

During treatment cell construction, monitoring probes will be placed at various locations within the soil pipe. These probes will be placed to monitor soil vapor and moisture content. The soil vapor probe is a section of two-inch diameter, slotted, schedule 40 PVC pipe capped on both ends, and fitted with a

compression fitting and 0.25-inch flexible tubing. The tubing will be labeled and will lead out through the side of the soils. For monitoring purposes, air samples from within the pile will be collected through this probe. A schematic of the monitoring probe is shown in Figure 5, Appendix A.

Routine monitoring of the system will consist of measuring soil moisture levels, vacuum levels, and volatile organic vapor levels in the pile and in the blower effluent. Remedial progress will be evaluated by monitoring CO_2 levels in the blower effluent. The presence of CO_2 above ambient levels indicates production of CO_2 due to microbial degradation. The CO_2 concentration in the air stream will give an indirect estimation of the level of contamination remaining in the soil.

It is expected that the system will be in operation for a duration of three to nine months. A Groundwater Technology technician will visit the site once every two weeks to monitor the performance of the system and inspect site conditions.

4. Closure

When the biodegradation process is complete, the CO_2 levels in the blower effluent will reach ambient concentrations. To verify that the soils have been adequately treated, confirmational soil samples will be collected. Composite samples will be collected from the two- and four-foot horizons in the same pattern as the baseline sampling. If the concentrations in these samples meet the closure criteria, the air flow system will be de-activated and the pile dismantled. The soils will be re-used by Scott elsewhere on the property. Because of the industrial nature of the historic land usage surrounding the Scott property, Groundwater Technology recommends clean up levels of 500 parts per million (ppm), or whatever is negotiated with the PADER based on background levels.

FIGURE 1

SITE MAP

PROJECT: SCOTT PAPER CO.

LOCATION: CHESTER, PA

JOB NO.: 300-000-9196

SOIL STOCKPILES

ALL TANKS EXCEPT NO. 6 OIL HAVE BEEN REMOVED

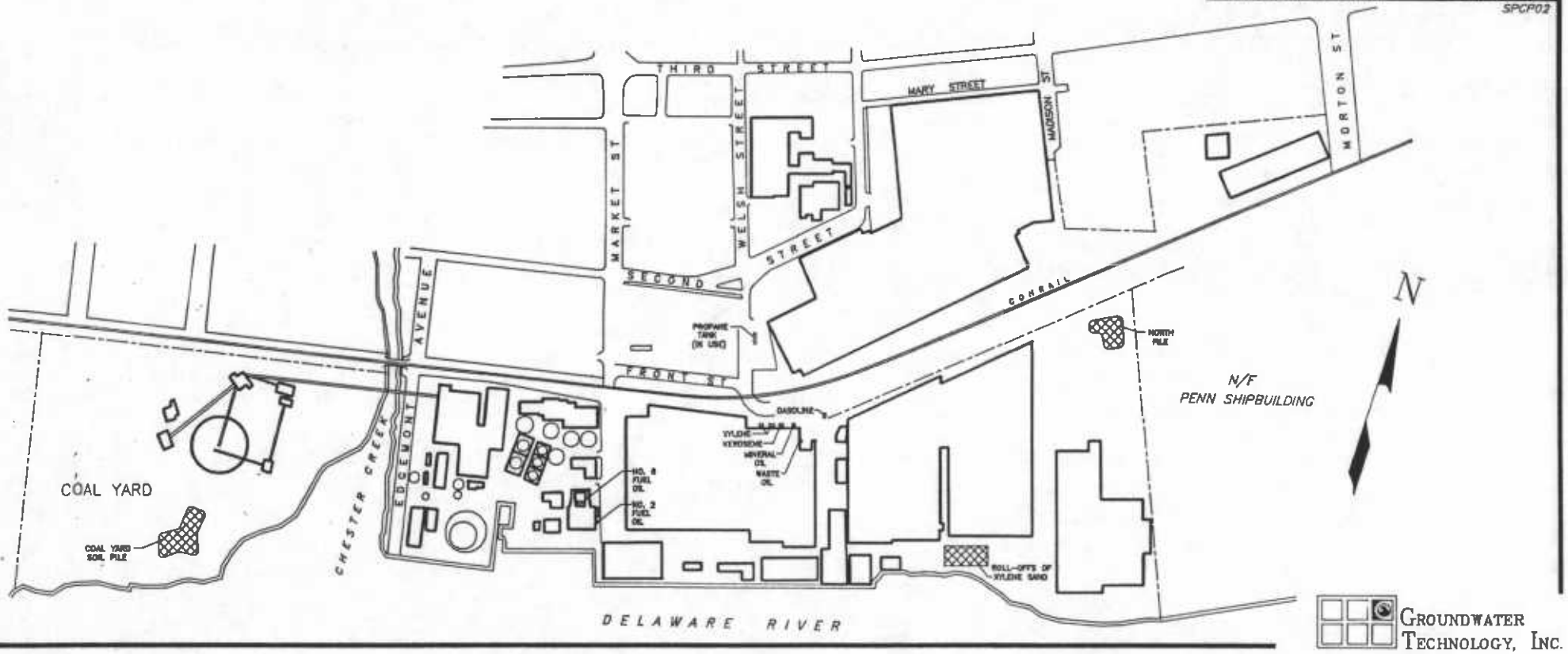
SOURCE: PLAN TITLED "CHESTER PLANT AND BUILDINGS PLOT PLAN" BY SCOTT PAPER COMPANY DATED 11/30/89

0 300

SCALE IN FEET

DRAWN BY: R. BLAZICEVICH MARCH 12, 1990

SPCP02



GROUNDWATER TECHNOLOGY, INC.

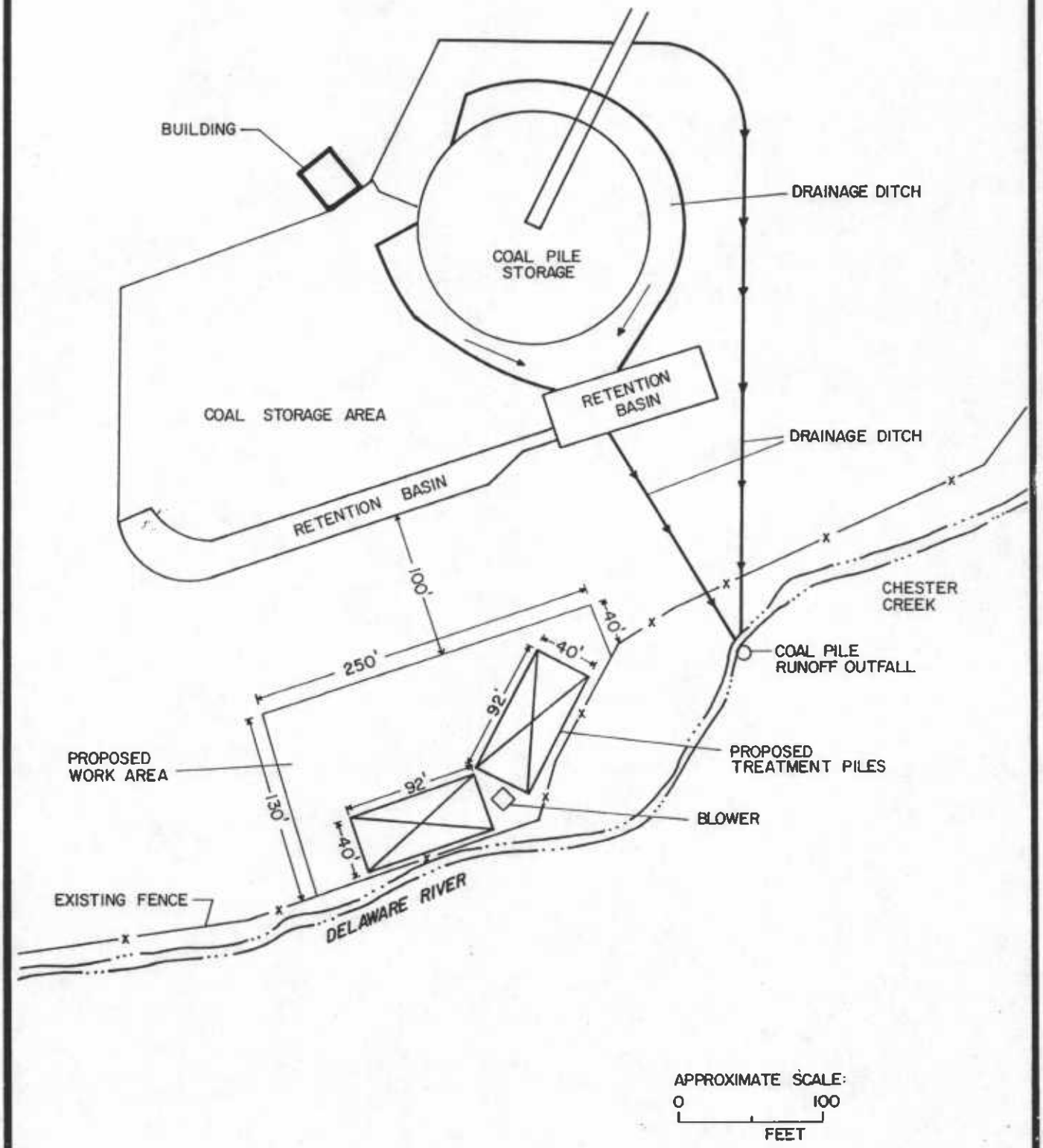
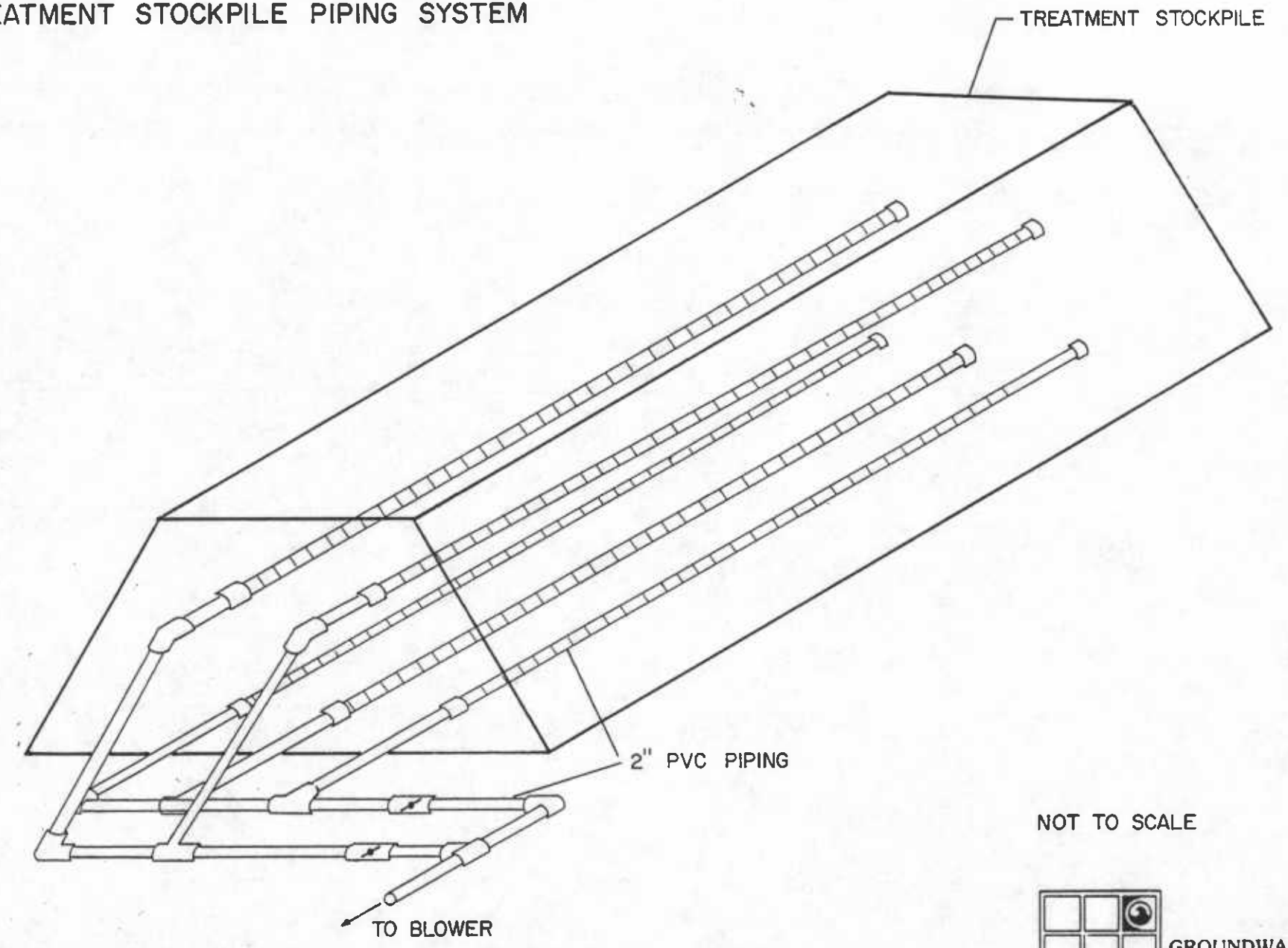


FIGURE 2
PROPOSED TREATMENT
STOCKPILE LOCATIONS

GROUNDWATER TECHNOLOGY, INC.

FIGURE 3
TREATMENT STOCKPILE PIPING SYSTEM



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GROUNDWATER
TECHNOLOGY, INC.

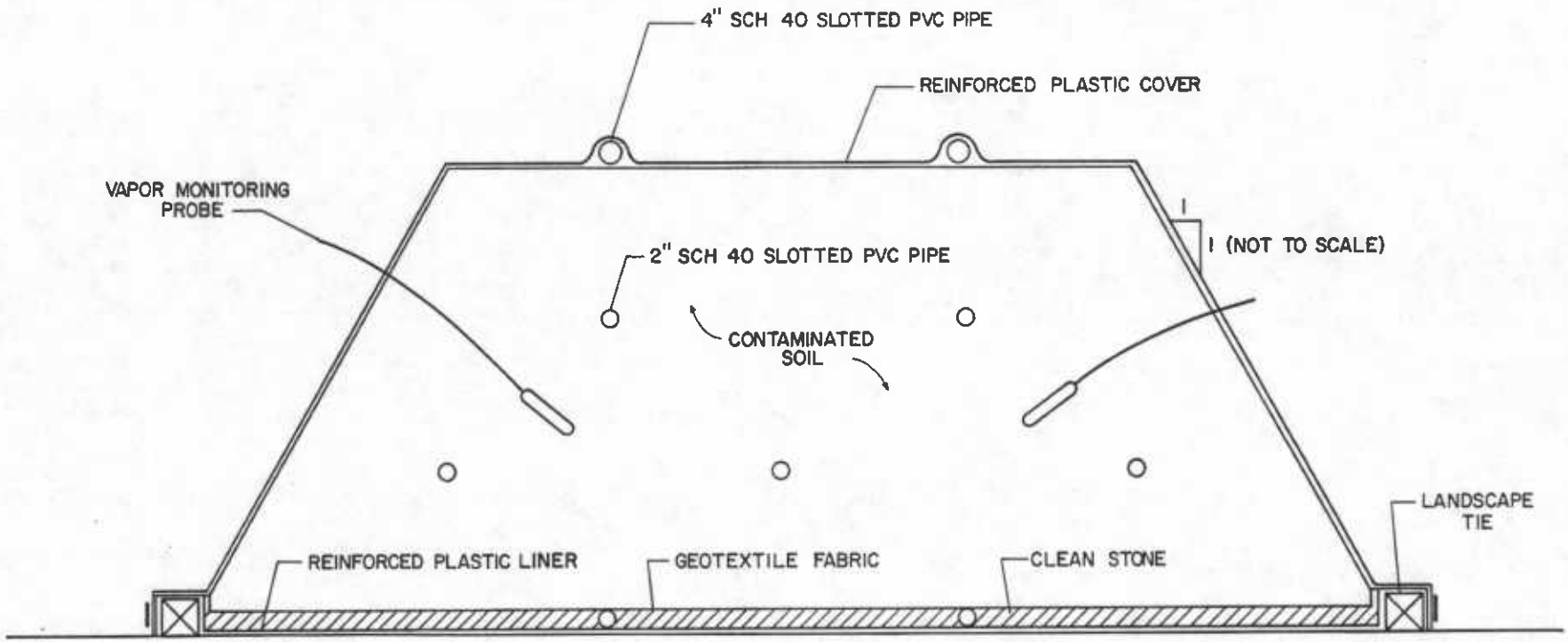

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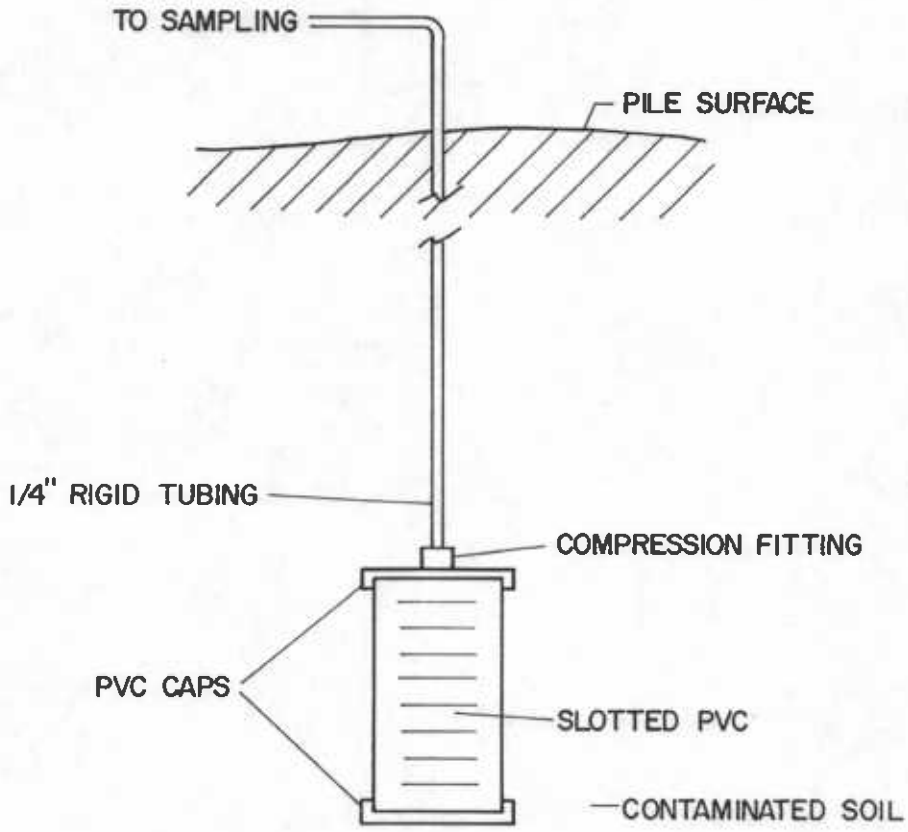
FIGURE 4
TREATMENT STOCKPILE CROSS SECTION

GROUNDWATER TECHNOLOGY, INC.



NOT TO SCALE

FIGURE 5
VAPOR MONITORING PROBE

GROUNDWATER TECHNOLOGY, INC.

APPENDIX B

PRELIMINARY WORK PLAN
SOIL PILE REMEDIATION

Scott Paper Company
Front and Avenue of the States
Chester, Pennsylvania

GROUNDWATER TECHNOLOGY, INC.

488/89

SCOTT
SCOTT WORLDWIDE

DER - REGION
NORRISTOWN

DEC 01 1989

November 28, 1989

Ms. Cynthia L. Steele
Water Quality Specialist Supervisor
Pennsylvania Dept. of Environmental Resources
1875 New Hope Street
Norristown, PA 19401

RE: Soil/Groundwater Monitoring and Remediation Work Plan

Dear Ms. Steele:

The purpose of this letter is to respond to your October 26, 1989 letter concerning the development of a work plan to determine the extent and mitigate the effects of soil and groundwater pollution discovered during the removal and closing of underground storage tanks at the Chester Facility of Scott Paper Company.

The underground storage tank (UST) removal project began in mid-August and continued through the end of September. A total of eight UST's were identified during the removal project and seven of these were removed. Please find enclosed a detailed account of the UST removal project prepared by Buchart-Horn, the environmental consultant for the project, including tank removal procedures, contaminated soil excavation procedures, and the results of all laboratory analyses conducted on soil and groundwater samples taken during the project. The eighth tank, a 20,000 gallon No. 6 Fuel Oil day tank, was unable to be removed due to worker safety issues and the stability of the surrounding structures. This tank has been emptied of product and steam cleaned and is currently registered as temporarily out of service. We propose to permanently close this tank by filling it with 20,000 gallons of Perma-Fill Foam material, disconnect and cap off any piping at or above ground level, and seal off the fill box area with concrete to prevent any attempt of future use. In addition, a series of hand-augered soil samples will be taken from the backfill material around the tank and analyzed by a certified laboratory for total petroleum hydrocarbons (TPH) to determine the extent of soil contamination in the immediate area of the tank.

The sources (action item No. 4 on your 10/26/89 letter) of the soil and groundwater contamination (leaking UST's) have either been removed completely (seven tanks) or temporarily closed (one tank). To assess the extent of soil and groundwater pollution and to evaluate the potential for future migration of the contamination, Scott Paper has retained Groundwater

Technology, Inc. of Chadds Ford, PA to conduct a hydrogeologic study of the area in and around where the UST's were removed. This study will include a soil gas survey of the areas near the sites of the xylene tanks, installation of a minimum of eight monitoring wells (down and cross gradient from the contaminated areas), an evaluation of soil contamination from the testing of split spoon samples as the wells are drilled, a complete hydrogeologic assessment of the aquifer properties, and a minimum of three groundwater sampling events (for TPH and volatile organics - Benzene/Toluene/Ethylbenzene/Xylene or BTEX) conducted at least one month apart (please see attached proposal from Groundwater Technology detailing their proposed scope of work). The results and recommendations of this study's final report will be used to develop a future groundwater remediation/monitoring program (please see attached proposed work schedule). This study has been designed to address action items No. 1, 2, 3, 5, 6, and 7 in your 10/26/89 letter.

With respect to the abatement of contaminated soil (addressing action items No. 5 and 7 with respect to soil abatement in your 10/26/89 letter) resulting from the excavation of the UST's, Scott Paper is currently conducting an in-house engineering review of the available soil remediation technologies and comparing on-site remediation with currently available disposal options to determine the most cost-effective and environmentally sound treatment/disposal method. We propose to complete this evaluation by December 31, 1989 and select a consultant for the soil abatement project by January 12, 1990. As soon as possible after the consultant is selected, we propose to meet with the Department to formally present a detailed path forward for the remediation of the contaminated soil (see attached proposed work schedule).

If you have any comments or questions concerning the information contained in this letter or on any of the action items on the proposed work schedule, please contact me at (215) 499-6104.

Sincerely,

David R. Haldeman

David R. Haldeman
ENVIRONMENTAL ENGINEER

Enclosures

cc: Mr. R. K. Anderson
Mr. M. M. Caron - Staff

PROPOSED WORK SCHEDULE FOR SOIL AND GROUNDWATER MONITORING AND REMEDIATION AT THE SCOTT PAPER COMPANY, CHESTER FACILITY

ACTION ITEM	TARGET DATE
TANK CLOSURE	
1. Permanently close UST (No. 6 fuel oil) near No. 2 Powerhouse by filling it with an inert material.	1/30/90*
2. Take a minimum of four soil borings from the backfill material around the tank to be permanently closed	1/30/90
GROUND WATER MONITORING	
1. Select hydrogeologic consultant.	11/30/89
2. Conduct soil gas survey in applicable areas.	1/15/90
3. Site and install monitoring wells including collecting split spoon soil samples at the air/water interface and analyzing them for the appropiate parameters (TPH, BTEX, PCB) based on the contents of the former UST's in the proximity.	1/30/90
4. Evaluate existing level of soil contamination by the results of the analytical testing conducted on the split spoon soil samples.	2/28/90
5. Conduct hydrogeologic studies to assess water table gradient, tidal influences, and hydraulic conductivity of the groundwater in the vicinity of the removed tanks.	2/28/90
6. Conduct a minimum of three groundwater sampling events - once per month for three months. Submit interim progress report after first groundwater sampling event.	2/28, 3/31, and 4/30 March, April, May
7. Submit report detailing results of groundwater monitoring program and including recommendations for groundwater remediation methods.	6/30/90
SOIL REMEDIATION/DISPOSAL	
1. Complete in-house engineering study of soil remediation/disposal options. (Study currently in progress)	12/31/89
2. Select method and consultant for the remediation of contaminated soil.	1/15/90
3. Conduct an initial meeting with the Department to discuss proposed soil remediation method.	2/15/89
4. Submit detailed work plan for soil remediation to the Department for review.	3/31/90

* Pending approval from the Department.

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SCOTT

SCOTT WORLDWIDE

May 17, 1990

RKB

Mr. Richard Breitenstein
Water Quality Specialist
Pennsylvania Dept. of Environmental Resources
1875 New Hope Street
Norristown, PA 19401

Dear Mr. Breitenstein:

The purpose of this letter is to propose the the permanent closure of the underground storage tank at the Scott Paper Company's Chester Mill. This tank could not safely be excavated due to its location. We propose to permanently close this tank by filling it with 20,000 gallons of Perma-Fill Foam material, disconnect and cap off any piping at or above ground level, and seal off the fill box area to prevent any attempt of future use.

The tank in question is located underneath the breaching for No.'s 8 and 9 boilers near No. 2 Powerhouse and was previously used to store No. 6 fuel oil. As was stated in our November 28, 1989 letter to Ms. C. S. Steele of your office, this tank was unable to be excavated due worker safety issues and the stability of surrounding structures. This tank has been emptied of product and steam cleaned and is currently registered with the state as temporarily out of service.

Please find attached a copy of the analytical results conducted by Groundwater Technology, Inc. on soil excavated from the installation of a groundwater monitoring well directly adjacent to the underground storage tank we are proposing to permanently close.

If you have any questions concerning this information, please contact me at (215) 499-6104.

Sincerely,

David R. Haldeman

David R. Haldeman
ENVIRONMENTAL SPECIALIST

Enclosure

cc: Mr. R. K. Anderson
Mr. M. M. Caron - Staff

GROUNDWATER TECHNOLOGY, INC.

Rt. 1 Chadds Ford West, Chadds Ford, PA 19317
(215) 388-1466 FAX (215) 388-6298

April 30, 1990

Refer: 300-000-9196

Mr. David R. Haldeman
Scott Paper Company
Front and Avenue of the States
Chester, PA 19031

RE: Lab reports for MW-2
Chester Operations Facility

Dear Dave:

As you requested, Groundwater Technology has had the laboratory re-issue a report presenting the analytical results from MW-2 in a separate document. MW-2 is located next to the abandoned No. 6 oil tank. This lab report should be suitable for submittal to the PADER concerning closure of the No. 6 tank.

If you have any questions or comments, please do not hesitate to call.

Sincerely,
GROUNDWATER TECHNOLOGY, INC.

A. Elizabeth Perry
Hydrogeologist

aep/s
Enclosures

GTEL
ENVIRONMENTAL
LABORATORIES, INC.
Northeast Region
Meadowbrook Industrial Park
Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

Project Number: 300-000-9196
Work Order Number: N0-01-601A

April 18, 1990

Elizabeth Perry
Groundwater Technology, Inc.
U.S. Route 1, Concord Building
Chadds Ford, PA 19317

Dear Ms. Perry:

This report previously dated 2/13/90, is a reissue.

Attached please find the analytical results for the samples received by GTEL on 1/25/90. The samples were received and analyzed as indicated on chain of custody number 23227, which is attached.

GTEL maintains a formal quality assurance program to ensure the integrity of the analytical results. All quality assurance criteria were achieved during the analysis unless otherwise noted in the footnotes to the analytical report.

The specific analytical methods used and cited in this report are approved by state and federal regulatory agencies.

If you have any questions regarding this analysis, or if we may service any additional analytical needs, please give us a call.

Sincerely,
GTEL Environmental Laboratories, Inc.

Mark M. Emmons
Gas Chromatography Manager

Lois Luniewicz
QA Liaison

Table 1

ANALYTICAL RESULTS

Aromatic Volatile Organics in Soil
Modified EPA Method 8020[a]

GTEL Sample Number		01	--	--	--
Client Identification		MW2,SS-2	--	--	--
Date Sampled		1/29/90	--	--	--
Date Analyzed		2/01/90	--	--	--
Analyte	Detection Limit, mg/kg	Concentration, mg/kg (dry)			
Benzene	0.10	< 0.09	--	--	--
Toluene	0.25	< 0.22	--	--	--
Ethyl Benzene	0.40	< 0.36	--	--	--
Xylenes (total)	0.85	< 0.76	--	--	--
BTEX (total)	--	--	--	--	--
Misc. Aliphatics (C_4-C_{12})	7.5	25	--	--	--
Misc. Aromatics (C_8-C_{10})	5.0	450	--	--	--
Total Hydrocarbons	--	480	--	--	--
Detection Limit Multiplier		0.90	--	--	--
Percent Solids		81.1	--	--	--

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methanolic extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

GTEL
ENVIRONMENTAL
LABORATORIES, INC.
Northeast Region
Meadowbrook Industrial Park
Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

Project Number: 300-000-9196
Work Order Number: N0-01-602A

April 18, 1990

Elizabeth Perry
Groundwater Technology, Inc.
U.S. Route 1
Chadds Ford, PA 19317

Dear Ms. Perry:

This report previously dated 2/28/90, is a reissue.

Attached please find the analytical results for the samples received by GTEL on 1/25/90. The samples were received and analyzed as indicated on chain of custody number 23227, which is attached.

GTEL maintains a formal quality assurance program to ensure the integrity of the analytical results. All quality assurance criteria were achieved during the analysis unless otherwise noted in the footnotes to the analytical report.

The specific analytical methods used and cited in this report are approved by state and federal regulatory agencies.

If you have any questions regarding this analysis, or if we may service any additional analytical needs, please give us a call.

Sincerely,

GTEL Environmental Laboratories, Inc.

Ulla Abrams for

Mark M. Emmons
Gas Chromatography Manager

Lois Luniewicz
Lois Luniewicz
QA Liasion

Table 1

ANALYTICAL RESULTS

Total Petroleum Hydrocarbons as Gasoline In Soil
Modified EPA Method 8015[a]

Sample Identification		Date Extracted	Date Analyzed	Concentration, mg/kg	Percent Solids, %	Detection Limit, mg/kg
GTEL No.	Client ID	--	--	--	--	--
01	MW-2 SS-2	2/5/90	2/8/90	< 10	82.0	10

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methylene chloride extraction by modified EPA Method 3550; modification as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision. Concentration calculated on a dry weight basis.

Table 1 (continued)

ANALYTICAL RESULTS

Total Petroleum Hydrocarbons as Diesel in Soil
Modified EPA Method 8015[a]

Sample Identification		Date Extracted	Date Analyzed	Concentration, mg/kg	Percent Solids, %	Detection Limit, mg/kg
GTEL No.	Client ID	--	--	--	--	--
01	MW-2 SS-2	2/5/90	2/8/90	< 10	82.0	10

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methylene chloride extraction by modified EPA Method 3550; modification as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision. Concentration calculated on a dry weight basis.

Table 1 (continued)

ANALYTICAL RESULTS

Total Petroleum Hydrocarbons as Mineral Spirit in Soil
Modified EPA Method 8015[a]

Sample Identification		Date Extracted	Date Analyzed	Concentration, mg/kg	Percent Solids, %	Detection Limit, mg/kg
GTEL No.	Client ID	--	--	--	--	--
01	MW-2 SS-2	2/5/90	2/8/90	< 10	82.0	10

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methylene chloride extraction by modified EPA Method 3550; modification as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision. Concentration calculated on a dry weight basis.

Table 1 (continued)

ANALYTICAL RESULTS

Total Petroleum Hydrocarbons as Kerosene in Soil
Modified EPA Method 8015[a]

Sample Identification		Date Extracted	Date Analyzed	Concentration, mg/kg	Percent Solids, %	Detection Limit, mg/kg
GTEL No.	Client ID	--	--	--	--	--
01	MW-2 SS-2	2/5/90	2/8/90	420	82.0	10

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methylene chloride extraction by modified EPA Method 3550; modification as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision. Concentration calculated on a dry weight basis.

Table 1 (continued)

ANALYTICAL RESULTS

Total Petroleum Hydrocarbons as Fuel Oil #6 in Soil
Modified EPA Method 8015[a]

Sample Identification		Date Extracted	Date Analyzed	Concentration, mg/kg	Percent Solids, %	Detection Limit, mg/kg
GTEL No.	Client ID	--	--	--	--	--
01	MW-2 SS-2	2/5/90	2/8/90	< 10	82.0	10

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methylene chloride extraction by modified EPA Method 3550; modification as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision. Concentration calculated on a dry weight basis.

Table 1 (continued)

ANALYTICAL RESULTS

Total Petroleum Hydrocarbons as Lube Oil in Soil
Modified EPA Method 8015[a]

Sample Identification		Date Extracted	Date Analyzed	Concentration, mg/kg	Percent Solids, %	Detection Limit, mg/kg
GTEL No.	Client ID	--	--	--	--	--
01	MW-2 SS-2	2/5/90	2/8/90	< 10	82.0	10

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methylene chloride extraction by modified EPA Method 3550; modification as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision. Concentration calculated on a dry weight basis.